MILL SECTION of

Concrete

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The Romance of Cement Manufacture

THERE is romance in the manufacture of cement, though to those engaged in it there often seems to be nothing but grim reality and plain hard work. They see the noise, the dust, the heat, the wear and tear—and the goal to many of them is the weekly pay check or the annual dividend.

That is one viewpoint. But there is another—a larger one in which the real accomplishments of the industry as a whole are brought into focus. With this viewpoint comes the thrill of accomplishment, the joy of the creator. For with the manufacture of portland cement, a material was produced that brought about a new era in construction and with it came a new conception of fire-safety, comfort, durability and beauty.

Romance lurks in the very processes employed in its manufacture. Prosaic, lifeless masses of rock and clay, inert and commonplace as they lie in the quarry pit, are given magic qualities that make them rival Aladdin's lamp. As rock and clay, they are not responsive to chemical reaction but when they are broken and ground to practically their molecular state, it is possible to change their very nature.

In the fiery hot furnace of the kilns this transformation takes place. Here, among other things, all the water and the elements of water are driven off. The clinker as it comes from the kiln again is inert because of its size and must again be reduced to a powdered state to make the cement responsive to chemical action.

And here the reverse of the cement manufacturing process begins. In the kiln and in the mills the rock has been reduced to a powder and all the water has been removed. Now water is added to cause the cement to return again to rock.

Thus the manufacturer of portland cement transforms inert, lifeless piles of rock and clay into an easily transported powder which (by simply returning to it the water taken from it during its preparation) may be returned to stone, shaped and fashioned into the many structures useful to mankind.

Public Relations

ATISFACTORY marketing conditions, even when the product sold is as highly standardized as portland cement, depend largely on the establishment of truly frank and sympathetic relations between manufacturer and user. Buyers of materials resent any seeming indication of secretiveness either in methods of manufacture or in details of sales and distribution.

Perhaps in no other industry does the user assume the role of judge of the manufactured product as frankly as in the cement industry. Every user of cement forms his own opinions as to its merits. He takes it upon himself to tell the manufacturer that this is not right or that ought to be remedied. And sometimes he feels that there exists a conspiracy of silence on the part of the manufacturer to keep him in the dark as to details of manufacture.

The technical engineer working with cement knows something of the difficulties of the cement manufacturer but the ordinary contractor and smaller user (who uses a vast amount of cement each year) does not. It is he who ought to be told the story of the manufacture of portland cement. He still thinks that cement is nothing but rock reduced to a powdered state. He has no conception of the technical difficulties nor the precise processes necessary in its manufacture.

A little knowledge is a dangerous thing. The user of cement should be told just what the manufacturer is doing for him. It is the manufacturer's duty to educate him and to take him into his confidence. By so doing he strengthens his own position and establishes those relations that will result in better understanding and confidence.

Cooperative Benefits

THE welfare of each individual plant in the cement industry depends on the condition of the industry as a whole. Cement manufacturers are today facing one of the critical periods of their history. Competition is keen and production exceeds demand. Truly cooperative effort now in bringing down production costs by making available to the entire industry the little kinks and devices that save small fractions of cents will save many thousands of dollars in total production costs.

Such a "comparing of notes" would enable each plant to gain more than it gave and the entire industry would benefit.

Construction of New Plant of Florida Portland Cement Company Makes Rapid Progress

A Detailed Description of the Design and Equipment Used in This Newest Florida Cement Plant Being Constructed Within the Corporate Limits of Tampa

By L. N. DURYEA

WITH the completion of 1300 feet of dock and bulkhead along Spackman's Bay at Tampa, Florida, and the erection of several concrete pouring towers, construction activities are fast turning Hookers Point into an industrial development of no little importance. The plant of the Florida Portland Cement Company, which is being built on this site, is being rapidly rushed toward completion. The foundations for the main buildings are being placed and superstructure will be started by the middle of September. The railroad tracks leading into the plant site are rapidly nearing completion and the heavy machinery is scheduled for placement early in the fall.

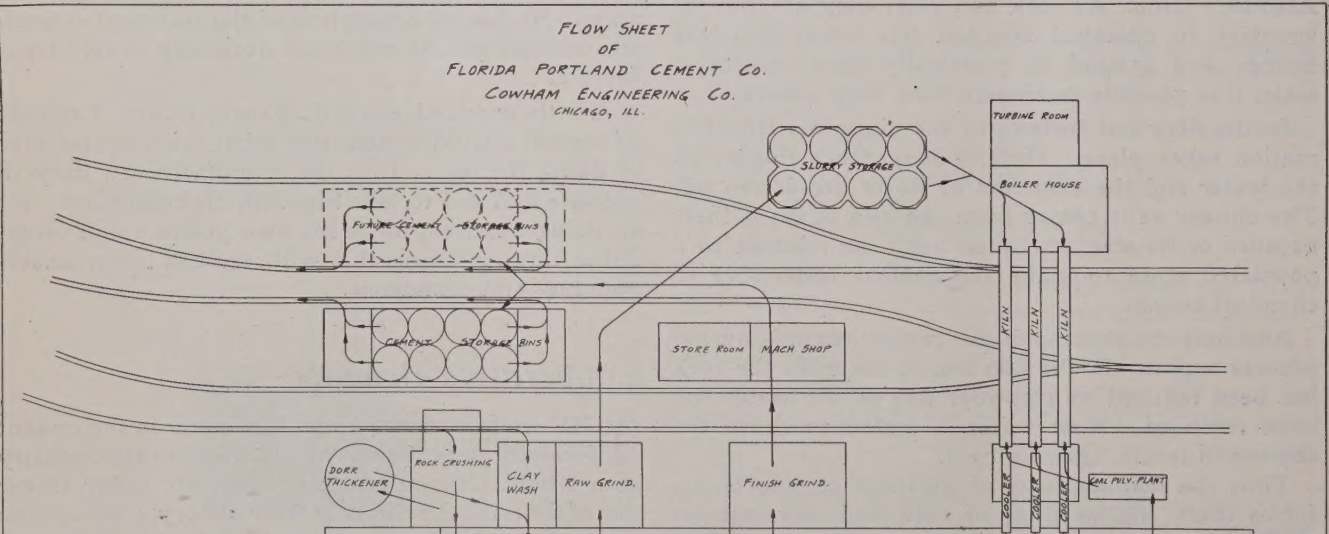
Location

The plant will be located on a 25-acre tract of land on Hookers Point abutting the deep water harbor and government channel. The site is served by the Tampa Northern Railroad, which provides direct transportation to the raw materials property 40 miles to the north. The site will be large enough to provide for a plant of an annual capacity of 1,500,000 barrels per year with the greatest economy of layout and will at the same time allow for proper expansion when demand warrants.

Tampa is a fast growing city with an estimated population of 150,000, and is recognized as an industrial center of the state. The location of the plant is within the corporate limits of Tampa, where advantage can be taken of ample housing facilities for the employees, as well as providing truck delivery to one of the largest cement markets in the state.

By the selection of the site and the design of the plant ample provision has been made for both shipment of the finished product and the incoming consignments of raw materials and fuel. Shipping facilities provide for boat, train and truck.

The location of the plant at Tampa gives the Florida Portland Cement Company excellent shipping service to

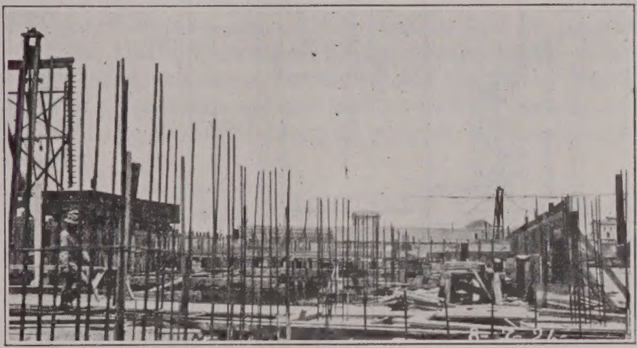


Flow sheet of the new plant, showing the routing of the production through the various departments from raw material delivery to the shipping out of the finished cement. This is to be a wet process plant of the most modern type all sections of the state. The Tampa Northern Railroad, a subsidiary of the Seaboard Airline Railway, connects with the Atlantic Coast Line Railroad about two miles from the location of the plant, allowing competing hauls to nearly all sections of the state.

Market

All points in Florida of large consumption are within a 200-mile haul. West coast towns can be served with 24-hour delivery and east coast points with two day delivery.

Direct loading into oceangoing ships and barges will be possible. This will allow water shipping into the seacoast and gulf ports of the southern states as well as into the foreign ports of the West Indies, Mexico, Central America and South America.



Here is the machine shop under construction—a well reinforced building

The Florida cement market has seen a tremendous development during the past few years. This development has carried beyond the real estate activities as evidenced by the great increase in the use of cement during the first six months of this year as compared with the corresponding period in 1925, during which time there was an increase in consumption of more than 650,000 barrels.

Fuel for use at Tampa will be available from the coal fields of Tennessee and Alabama or the oil fields of Southern Texas. The plant will be equipped to use both coal and oil.

Raw Materials

The raw material properties are located 40 miles north of Tampa in Hernando County, near the town of Brooksville, on the Tampa Northern Railroad. Approximately 600 acres of clay and limestone properties have been purchased—a quantity sufficient for the manufacture of 160,000,000 barrels of portland cement.

The selection of the raw materials properties in Hernando County is the result of a survey of many months throughout the state. On the particular property there is very little over-burden covering the limestone which, together with its soft texture, requires a minimum amount of drilling and blasting and will make quarrying relatively easy.

The limestone to be used by the Florida Portland Cement Company is known as the Tampa formation. It is of high calcium content and a light color. The Hernando County deposit is the highest elevation of the formation and is known as the "Annatallagga Hummock". In many places it affords a natural face of 50 to 75 feet in height, and in no place will it be necessary to contend with any but the simplest track and grade problems in quarrying.

The deposit was thoroughly core drilled and complete records made of each drill hole. It was tested to a depth of from 150 to 200 feet.

During the period of survey for desirable raw materials, a carload of limestone and clay was taken from these properties and shipped to the plant of the Peninsular Cement Company, Cement City, Michigan, where it was ground and burned in the regular way. This test showed that grinding and crushing was greatly facilitated by the soft texture of the stone and the briquettes from the resulting cement showed an average tensile strength of 301 pounds per square inch at seven days and 450 pounds per square inch at 28 days.

The limestone and clay will be hauled to Tampa in standard railroad gondola cars, where it will be dumped by means of a revolving tipple into a pit of sufficient capacity to take care of more than one day's operation. This will provide for the operation of the crusher and the clay wash mill in a way which best suits the operation of the balance of the plant. Waste heat boilers will be used. There is an advantage in this arrangement as it will allow equalization of the power load. Steam shovels will be used in both the clay pit and limestone quarries.

Crushing Plant

From the pit beneath the revolving car tipple, the stone and clay will be elevated by means of a traveling crane fitted with a heavy orange peel bucket, the stone being dumped in a 36 by 60-inch Fairmount crusher, supplied by the Allis Chalmers Manufacturing Company. The clay will be dumped into a 26-foot wash mill.

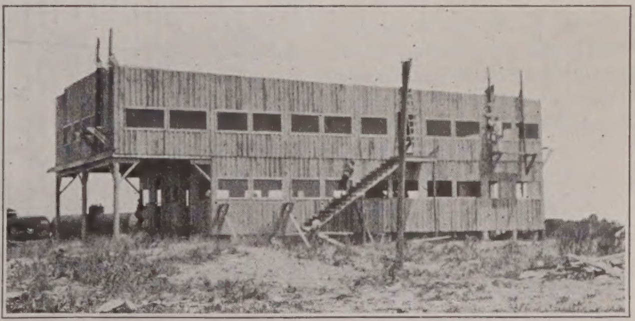
The Fairmount crusher will be mounted on an elevated concrete foundation and will discharge its product into a revolving screen located below the crusher. The residue of oversize material from this screen will be spouted to a No. 5050 Dixie Mogul swing hammer mill. The product of the hammer mill will then combine with the undersize material from the revolving screen and will be spouted directly to the main storage building.

Storage

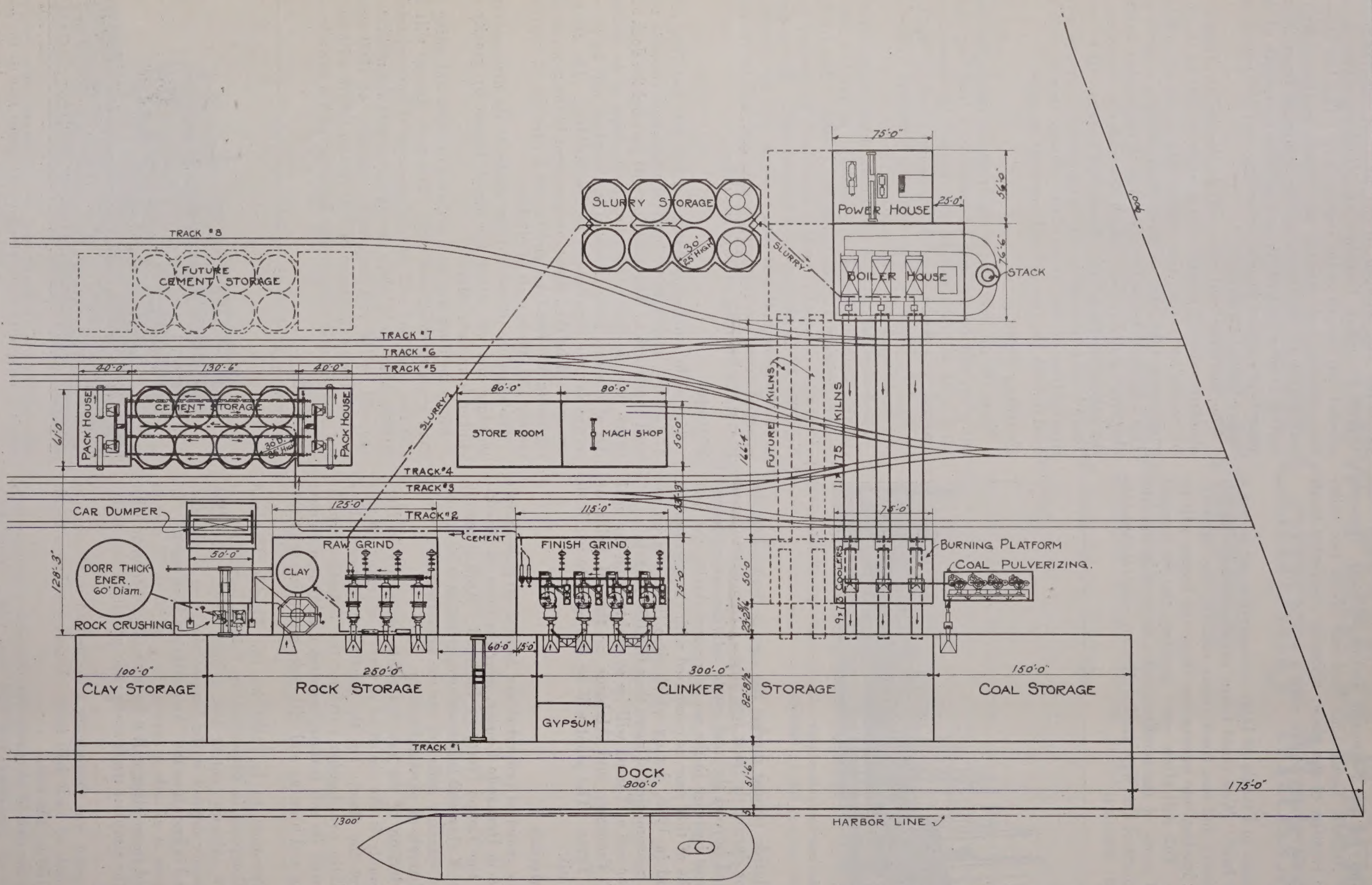
The main storage building will be 800 feet long and 82 feet 8½ inches wide, built of reinforced concrete and steel construction. This building will parallel the dock and hence provide direct unloading from ships, if so desired. All of the raw materials used in the plant will be stored in the various departments of this building. The clinker storage will be the largest compartment in the main building being 300 feet long and having a capacity of approximately 150,000 barrels of clinker.

The kilns are placed at right angles to the main storage building and will allow the direct deposit by gravity of clinker from the coolers.

Along the dock will be a railroad to allow unloading of coal, gypsum, rock and clay. The rock storage will be 250 feet long and will have a capacity of approximately 20,000 cubic yards, while the clay section of the main storage will be 100 feet long with a capacity of 7500 cubic yards. The coal storage of 150 feet in length will be in the opposite end of the main building with a capacity of 7500 tons.



This building will eventually serve as the company store, but just now it is being used as a dormitory and dining hall for the men erecting the plant



General plant layout of the new Tampa plant of the Florida Portland Cement Company, showing the location of the equipment and the size of the structures. Note the provisions for expansion. The routing of production is shown in the previous drawing

The main storage building will be equipped with two bridge traveling cranes of 80-foot span, each of which will be able to operate throughout the 800-foot length of the building. They will be equipped with clam shell buckets for handling the materials.

While in normal operation the clay will be dumped from the pit under the revolving tipple into the wash mill, a space will also be provided in the main storage building for a reserve supply of clay.

In the raw grinding department there will be three No. 8726 Allis-Chalmers wet grinding compeb mills. The stone will be delivered to the bins above these mills by the cranes in the main storage building and the clay slurry will be pumped from the storage tanks in connection with the wash mill direct to the compeb mills. Provision will be made for accurate proportioning of clay and limestone before grinding so that little correction will be required after the slurry is pumped to the storage tanks. These slurry tanks will be so connected that the slurry may be pumped direct from any one tank to the kiln feed bin or a blend of two or more tanks may be made in the correction tanks.

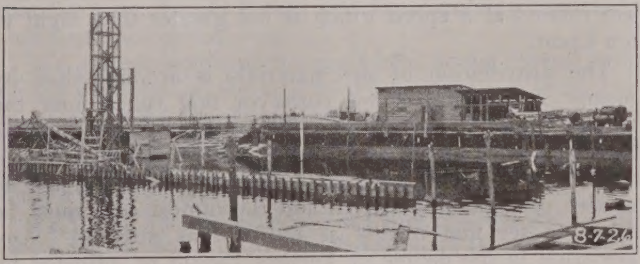
Kilns

Three 11 by 175-foot rotary kilns are to be installed at the present time. Provision has been made for the installation of two additional kilns. These rotary kilns will be driven by 75 horsepower, two-speed wound-rotor motors, which are provided with resistance for speed variation. Variation will be from full to half speed, this being effected by a pole changing switch.

The clinker from the kilns will discharge by gravity into three 9 by 73-foot rotary coolers, which in turn discharge directly into the main storage building. The kilns will be equipped for burning either coal or oil. The coal grinding department will consist of three Raymond Special low-side five-roller mills equipped with pneumatic feed controls. The air separators attached to the Raymond mills will be so located that a short elevator will lift the coal from this department to a screw conveyor running over the top of the coal feed bins in front of the kilns.

From the storage building, clinker and gypsum will be delivered to the finish grind mill bins by means of the traveling cranes. The finish grind department will consist of four No. 8726 Allis-Chalmers compeb mills each equipped with a 14-foot air separator.

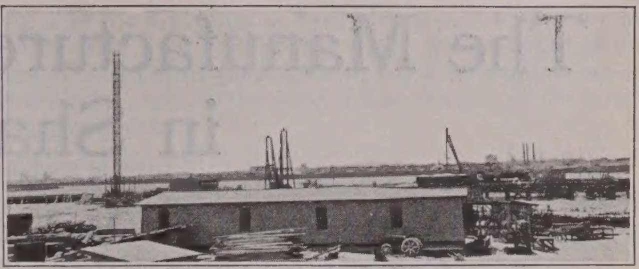
The conveying equipment in connection with the finish grinding mills will be arranged so that the mills can deliver their product in closed circuit with the air separator or in open circuit. The finished cement will be delivered by Fuller-Kinyon pumps direct to the 100,000 barrel silo storage.



Placing the concrete in the dock wall, with chuting tower No. 1 under erection

Pack Houses

Cement for rail and truck shipment will be sacked in the pack houses located at each end of the silos. Provision is also being made to deliver cement in bulk to the pack house located on the wharf for boat shipments.



General view of the site of the future plant, taken at high tide, with construction operations under way

Power Plant

Steam for power and light will be furnished by waste heat boilers. Each kiln will be equipped with an Edgemoor water tube boiler with 9170 square feet of heating surface. These boilers are built for 225 pounds per square inch working pressure and will be equipped with Foster superheaters for 150 degrees superheat and with Foster one-pass counter current economizers.

The generating equipment will consist of one 4,000 kw. and one 1,250 kw., 3-phase, 60-cycle, 2300-volt, 80 per cent power-factor Allis-Chalmers steam turbine alternator units. As the principal load of the cement plant will consist of seven 550-horsepower synchronous motors driving the compeb mills, the power factor of the plant will be high so that these turbines can carry considerably more than their normal rating without overload.

Surface condensers will be used in connection with the steam turbines, the salt water from Tampa Bay being used for cooling. The turbo-generators will be equipped with Griscomb Russell air coolers with the cooling air in closed circuit preventing dust from accumulating on the windings of the alternators.

Dust Collection

The plant as designed will be practically dustless. The coal grinding department will be arranged so that any accumulated dust will be blown directly into the kilns. As the wet process is used in the raw grinding department that will, of course, be dustless. The clinker grinding department and pack houses will be equipped with dust collectors. The waste heat boilers in connection with the kilns will be designed to collect as much dust as possible. The kiln gases after passing through the boilers and economizers will be washed in the spray washer before being delivered to the stack.

As the plant will be situated within the city limits of Tampa, special care will be given to this question of preventing dust.

Personnel

The layout of the plant has been designed by the Cowham Engineering Company and is similar to the general plan of the Signal Mountain Portland Cement Company at Chattanooga, Tennessee. The company will operate as the Florida Portland Cement Company and will market its material under the Cowham System trademark.

John L. Senior is president of the Florida Portland Cement Company. R. C. Newhouse, formerly chief engineer of the Crushing and Cement Machinery Department of the Allis-Chalmers Manufacturing Company and now vice-president and manager of the engineering department of the Cowham Engineering Company, and F. E. Dodge, chief engineer of the Cowham Engineering Company, were responsible for the design and layout of the plant.

The Manufacture of Super-Cement in Shaft Kilns

A Description of Methods of Manufacturing Super-Cement in Shaft Kilns—Types of Raw Materials Best Adapted to Use in Shaft Kilns—Hints on Operation of Shaft Kilns—Effect of Fine Grinding—Importance of Proper Burning—Results from Experiments

By DR. ING. AUGUST BUES

THE idea is generally prevalent in technical circles that the rotary kiln produces better clinker than the automatic shaft kiln. It is commonly said that "the rotator is after all a rotator."

There is no doubt but that properly burned clinker obtained from the rotary kiln has certain advantages as far as its external appearance is concerned. The round, bluish-black granules are pleasing to the eye. On the other hand, the clinker obtained from the shaft kiln, even when it is burned just as thoroughly as the rotary kiln clinker, appears as a mass of unformed lumps. That may be the main reason why the aforementioned statement of the superiority of the rotary kiln is made. But, unfortunately, this statement is often interpreted to apply to the quality of the clinker and not merely its external appearance. It is true, moreover, that it has only been in the past few years that it has been possible to obtain a clinker from the shaft kiln that could compare in quality with the clinker made in the rotary kiln. But this is now changed and there are today a number of large cement mills that are equipped with shaft kilns and that produce a cement having strengths of 350 to 400 kilograms per square centimeter after a period of three days. It is evident that the old idea about the superiority of rotary kiln cement must be revised.

It was necessary to equip the automatic shaft kiln with various auxiliary apparatus, and to operate the installation with the same degree of care that is taken in operating the rotary kiln before these results could be obtained. The first and most important consideration in this connection is the manner in which the raw materials are prepared for burning, such as the thoroughness with which the particles in the mixture of limestone and cement rock are blended. There must be no great variations in the composition of the mixture, if a super-cement is to be obtained with shaft kilns in a continuous operation.

Raw Materials

As far as the physical character and the suitability of the raw materials for cement manufacture in the shaft kiln are concerned, the author subscribes to the following belief, namely, that a good grade of clinker can be obtained in the shaft kiln from any generally used type of raw material. It is often contended that only some raw materials are suitable for this purpose. No one will dispute the fact that it is easier to prepare some types of raw material for the shaft kiln than others. For instance, it would be more difficult to prepare a material consisting of a hard crystalline limestone and a lean cement rock, or a material such as marl with the addition of shale, particularly when the latter also contains certain proportions of oil. Those are accepted facts. Nevertheless, machines are available at the present time that can prepare all raw materials for the shaft kiln. It is only necessary to give the raw materials the proper treatment and to select the machine that is best suited for this purpose, to insure the required properties in the finished cement. One example only need be mentioned to bring out the importance of this matter. It is understood that the firmer the raw materials, the better the clinker, and hence it is evident that the more friable and softer they are, the poorer will be the clinker. But this is not always the case. According to the experience of the writer in this field, friable soft materials have often been used in the shaft kiln and have resulted in the formation of clinker that was just as good in quality as that obtained from firm materials. Careful placing of the raw materials, proper manipulation of the fire and other similar precautions prevent the occurrence of excessive pressure by the mass that lies above them.

Methods

It would lead us too far afield to investigate the comparative advantages of all methods and equipment used in the manufacture of super-cement, for each and every cement mill has its own peculiarities and local conditions that must be taken into consideration. However, the writer wishes to touch upon the mixture and raw materials and fuel, for this is a very important point. The proper distribution of the fuel is accomplished by means of a special device which is provided with plates. These plates are rotated at a speed which is not greater than eight to ten r.p.m.

The distribution of the materials is accomplished by means of a double screw conveyor that runs under the storage bins. Great care must be exercised to see that the feeding of raw materials into the shaft kiln is regular and continuous. The fineness of the grinding of the materials is also of great importance and the utmost care must be taken to see that this is as uniform as possible. Any deviation in the degree of fineness should be adjusted by making the proper mixture of the various batches of material from different storage bins.

Burning

Correct burning in the automatic shaft kiln is the prime requisite for the manufacture of a high grade of cement. It is true that a number of indications have been found whereby the operator can tell just how this process is progressing, but it is also true that the operator should have a certain instinctive hunch for the operation that takes place in the kiln and be able to tell just how it is progressing by mere observation.

The greatest difficulty that the operator who is not sufficiently experienced in this work meets with is to know just when his fire is not burning properly. Every plant will have its own ideas about this matter and will adopt its own indications in this respect. Nevertheless there are certain fundamental rules observed by the author during his long years of experience that apply to all cases and to all installations where the shaft kiln is used. They are as follows:

1. Firing is in the form of a ring or circle of fire, and this circle of fire or flame must be seen at every door of the shaft kiln or observation point.
2. The fire must never appear to break in the middle of the shaft kiln. It must be seen at a point that is approximately one meter below the top of the raw materials.
3. The density of the smoke affords an idea of the intensity of the fire, when the fire is correctly placed.
4. The clinker must be warm when it leaves the shaft kiln. A high, brisk, crackling ring of flame, the so-called straw fire, is not desirable, and results in improperly burned clinker. This kind of a fire occurs when there is an excess of air entering the kiln or when too little fuel is being used, or when both these conditions prevail. To remedy this use more fuel and less air until the kiln begins to smoke again.

Too little air is indicated by a visible center fire with weak, deep rim flames. Just as soon as large amounts of steam collect in the center of the kiln, the middle fire becomes too deep. This is also a faulty condition. The remedy is a full blast of air through the kiln and slower agitation of the grate bars.

Steam vapors must not be confounded with smoke. Large amounts of the former merely indicate that the fire is too deep, while too much fusing smoke indicates an excessively large burning zone in the shaft kiln. The normal release of cement dust from the kiln is something that cannot be described but must be learned from experience. The experienced man can tell immediately by looking at the stack whether the amount of dust leaving the stack is normal or not.

Condition of Clinker

When the clinker is cool as it leaves the kiln, it is an indication that the kiln has been overloaded. The shaft kiln must be operated so that the clinker feels warm as it leaves the kiln. Under these conditions the air is heated before it reaches the burning zone in the kiln and thus effects a saving in fuel. In the second place it indicates that the rule, "rapid fusing and rapid cooling" has been sufficiently complied with.

The correct height of the shaft kiln or the correct ratio of the diameter of the kiln to the height is an important requisite in the proper performance of all the operations involved in the burning of cement in shaft kilns, and hence it is of greatest importance in the manufacture of supercement by this method.

With the advent of super-cement, the efforts of the cement mills using shaft kilns were naturally directed toward the manufacture of an improved product, though there was no intention of manufacturing a super-cement. The difficulties cement mills have had with grinding equipment in the manufacture of super-cement are well-known. It was a very troublesome matter to obtain the proper degree of fineness. Later a number of special grinding machines were introduced on the market, particularly designed to give a higher degree of fineness with the same consumption of power and with the same productive capacity as the ordinary grinders. Improvements made on old equipment with the idea of improving it and making it suitable for this purpose have also given satisfactory results. One improvement that might be mentioned is the use of a hollow grinder in which a double grinding action takes place, both in the interior and exterior of the grinding mechanism.

Effect of Fine Grinding

The following example shows clearly how it is possible to improve the quality of cement in a very simple manner.

A shaft kiln cement mill obtained cement that had compressive strengths of from 320 to 350 kilograms per square centimeter at 28 days. The raw materials were then ground to increase their fineness to a point where an average of 20 to 25 per cent remained on a 900-mesh screen. The raw materials were tested in this mill only on a 900-mesh screen. The fusion of the raw materials, however, was considerably improved as the fineness increased. When less than 4 per cent were retained the burning could not be further hastened. To grind the raw material to a fineness that permitted the per cent residue to pass the 900-mesh screen would simply be a waste of energy.

Experiments

Burning tests were carried out in a specially constructed kiln. Various samples with variations in fineness were used while burning conditions were maintained constant during the experiments. Burning was regulated so that the samples of the finest raw materials were fused. These experiments afforded very important conclusions regarding the usefulness of fine grinding in raw materials.

An average sample of clinker obtained from large scale operations, which was burned from raw materials that left a residue of 20 to 25 per cent on the 900-mesh screen, was mixed with 2 per cent cement gypsum—just like in large scale operations—and then ground in a laboratory mill until the residue left on a 4900 mesh screen was 12 per cent. When samples were made up from this cement in the ratio of 1:3, the following strength results were obtained:

Two days.	Three days.	Seven days.	Twenty-eight days
176	213	248	293

The figures are all in kilograms per square centimeter and agree with the results obtained with cement made on a large scale in the plant.

The same clinker was then mixed under like conditions with 3, 4 and 5 per cent of gypsum and then ground to the same degree of fineness in a laboratory mill. The following strength results were obtained:

	2 days	3 days	7 days	28 days
3 per cent	196	213	240	370
	206	262	321	372
	252	306	377	532

The figures are again given in kilograms per square centimeter.

Tests showed that there were no signs of the separation of gypsum, up to a total per cent of 5 per cent in the cement up to a period of 28 days. The variation in the resistance of the cement to tension is the same as in that of compression. When the proportion of gypsum was increased, it was seen that the strength of the cement suffered. Naturally the reduction in the tensile strength was greater than that of the compression strength. Fissures were also remarked in the cement samples when the gypsum proportion was increased. The accelerated volume constancy tests were better with the samples containing increasing proportions of gypsum. Normal samples remained unchanged up to a content of 5 per cent gypsum. The time of setting in the case of 2 per cent gypsum was

1.5 hours and in the case of 3, 4 and 5 per cent gypsum it was three to four hours.

Parallel experiments were carried out in other mills with different kinds of raw materials and these experiments showed that the results were the same as above when gypsum was added to the cement, although in most mills the maximum addition of gypsum was 4 per cent, when a crystalline product was employed. Each cement clinker was able to endure a large addition of scorified gypsum, and the author has found the same results with a 5 per cent addition of the scorified gypsum as took place with a 4 per cent addition of ordinary crystalline gypsum.

While it appears to be a favorable condition that the strength of the cement is materially enhanced by the addition of gypsum, nevertheless this measure is without any practical value, as it is forbidden to add more than 3 per cent of foreign ingredients in the manufacture of portland cement. Hence new ways must be found in the burning of the cement in the automatic shaft kiln in order to obtain a product which can be designated as a super-cement.

Cements were accordingly burned in the shaft kiln with the aid of coke breeze. The results were not good. Rotary kilns were also operated with coke breeze but the results were again not favorable and a better clinker was obtained with anthracite.

The author recently had some experience with a cement mill that was equipped with four rotary kilns and that manufactured a cement for shipment overseas. In order to maintain a setting time of one to two hours, which is required in the tropics, it is necessary to add 4 per cent of gypsum. When mixed with sand in the proportion of 1:3, this cement after the third day had a strength of 350 to 400 kilograms per square centimeter, when its fineness was such that 10 to 12 per cent remained behind on the 4900 mesh screen.

When the burning was more intense the strength rose to 500 kilograms per square centimeter after the third day (1:3 proportion). The cement was burned with anthracite and this increase in strength could be laid only to this fact, as the ash content of the coal was only 10 to 13 per cent.

It is understandable that the raw materials which were used for making this cement and which were of a very high quality would also give good results when used in the shaft kiln. But the fact that the shaft kiln will give good results even with lower grades of raw materials and only when anthracite is used as the fuel can be seen from the following:

A German plant, equipped with rotary kilns, installed a shaft kiln. The raw material consisted of a hard limestone and oil shale, and hence were entirely unsuited, according to common opinion, for use in the shaft kiln. While a very high grade cement was obtained with the rotary kiln, the shaft kiln clinker which was burned with coke breeze gave a cement which was scarcely of fair quality. In the effort to improve the quality of the shaft kiln cement, it was determined to use anthracite fuel. The results were scarcely believable. With exactly half the amount of coal that was required for the operation of the rotary kiln a clinker of the highest quality was obtained in the shaft kiln. The high grade cement of this work was "understandingly" manufactured in the rotary kiln with the use of all sorts of devices. Strength tests of 350 to 400 kilograms per square centimeter after a period of three days in a proportion of 1:3 were obtained in compression, and the tensile strength was also satisfactory.

The normal raw cement mixture which was burned with anthracite coal in the automatic shaft kiln—both the rotary kiln and the shaft kiln were fed with the same kind of raw materials—gave a clinker which was mixed with 3 per cent of gypsum. After a period of three days a sample made in the proportion of 1:3 was found to have a strength in compression of upwards to 380 kilograms per square centimeter and a strength in tension of from 30 to 31 kilograms per square centimeter. And it must be pointed out here that these strengths were obtained with a cement that had not been subjected to special grinding, and neither had the raw materials been ground specially before burning. Furthermore these results were obtained with a cement that had not been manufactured under any special conditions and without selecting raw materials whose quality was best suited for use in the shaft kiln.

In the first place, the uniformity of the anthracite coal dust that was used in the burning of the cement afforded a steadier burning than the coke flame, which always varies in quality. The ash content of coke is very variable, while the ash content of anthracite from one and the same mine varies but little and usually amounts to between 8 and 10 per cent. For this reason alone, the impurities that are introduced into the cement through the ash content of the fuel are very slight in the case of anthracite.

Even if the total ash content of the anthracite coal would have been absorbed by the clinker in the shaft kiln, which cannot be the case, the same product as far as chemical composition is concerned was obtained as when only 50 per cent of the ash were absorbed in the rotary kiln.

It is thus seen that the objection that has been raised to the shaft kiln in that it burns irregularly can be removed when the proper precautions are taken in the operation of this equipment. The fact that the intensity of the burning has no limit and that it can be easily adjusted by the operator as well as the fact that the shaft kiln can be readily adapted to all conditions, removes the objections that have been raised to its use for the manufacture of super-cements. It is a fact that when all other conditions are maintained constant and when the same raw materials are fed into both kilns, the operation of the shaft kiln will be less costly than that of the rotary kiln.

Gypsum Mined and Sold by Producers in 1925

The gypsum industry was highly productive in 1925, according to a statement made public by the Bureau of Mines, Department of Commerce, based on reports received from 62 operators in 19 states, and collected in cooperation with the geological surveys of Iowa, Kansas, Michigan, New York, Texas, Virginia and Washington. The quantity of gypsum mined in 1925 was 5,678,302 short tons, which is the largest output ever recorded and exceeds that of 1924 by more than 600,000 tons, or nearly 13 per cent. The value of the sales of both crude and calcined gypsum was $47,893,573, an increase of more than $5,000,000, or 12 per cent, compared with 1924. Over 1,000,000 tons was sold crude and 4,104,735 tons was sold calcined. The value of the gypsum sold crude was $2,823,229, or $2.78 per ton, and the value of that sold calcined was $45,070,344, or $10.98 per ton. New York is the largest producer of gypsum. The production of crude gypsum in that state in 1925 was 1,730,254 short tons—30 per cent of the entire output—an increase of 17 per cent compared with 1924. It was also the largest seller of crude and calcined gypsum, 354,394 tons of the former (or 35 per cent of the total) and 1,193,520 tons of the latter (or 29 per cent of the total) being marketed in New York in 1925. These were considerable increases over 1924. Other important states in the production of crude gypsum were: Iowa, 800,167 tons; Michigan, 649,053 tons; Texas, 558,132 tons; and Ohio, 551,479 tons. These five states reported nearly 76 per cent of the total.

Electric Blasting

Ways and Means of Avoiding Trouble in This Method of Firing Explosives

By CHARLES S. HURTER, S.B.

THE use of the electric method for firing blasts is continually on the increase. Electric blasting established itself as the standard practice in quarry work years ago because of the early recognition of the benefits gained by firing a number of holes simultaneously. In coal mines, where regulations usually prohibit firing more than one shot at a time, electric blasting naturally made its way more slowly, but, as the safety features became more widely known through the efforts of the Bureau of Mines and the manufacturers of explosives, its adoption in gaseous and dusty coal mines was both rapid and extensive. In other underground operations electric blasting has grown to large proportions with the perfecting of delay electric blasting caps and delay electric igniters. The advantages of this method of firing blasts are so many that they will doubtless lead to a still wider adoption of the practice. The purpose of this article is to aid users of electric blasting by discussing some of the difficulties that are encountered at times and the best means of overcoming them.

The basic requirement for a successful electric blast is securing the passage of an equal and sufficient amount of electric current through each electric blasting cap or other electric firing device in the circuit, at the same instant. At least 90 per cent of the troubles met with in electrical blasting are electrical. These as a rule can be traced to three causes: namely, insufficient current, building-up effects when the current is applied to the blasting circuit, or uneven distribution of the current. Whenever electric blasting caps misfire but can be exploded by another application of the current, the trouble is purely electrical and can usually be located by investigation along this line.

Insufficient Current

According to investigation, it requires a half ampere of current at half a volt to heat the bridge wire of an electric firing device sufficiently hot to ignite the priming charge. To heat the bridges of all the caps in a series to this temperature simultaneously requires 1½ amperes. The regular recommendation is to provide 1½ amperes for each electric blasting cap or series of electric blasting caps and about 1½ volts, depending on the length of the wires, for each cap in a series. In parallel connections the amperage per cap can be reduced.

The blasting machines sold by the various explosives companies are designed for use with straight series connections only. They all produce a current of about 1½ amperes, but in larger machines the voltage is increased to furnish sufficient force to drive the current through the greater resistance of a larger number of electric blasting caps. When trouble arises in firing a series circuit with a blasting machine it is sometimes found to be due to the fact that the machine, because of age or improper treatment, is below its rated capacity. To prevent trouble from this cause it is always wise to test a blasting machine by firing an electric blasting cap through the calculated resistance of the circuit on a rheostat before attempting to fire the blast.

More frequently when a blasting machine fails to deliver sufficient current to fire a blast within its rated capacity, the trouble is due to failure to operate the machine properly. One should never forget that speed of operation means power. The faster the rack bar is pushed down the more current there will be to flow through the blasting circuit at the end of the stroke. The smaller machines, with the exception of the small pocket type used in coal mines, are series wound dynamos. The stronger machines are compound wound. The current starts from the residual magnetism in the soft iron cores of the magnets and as the armature is rotated by the descending rack bar, the current which is generated is short circuited through the wires around the magnets, increasing the magnetism of the cores, which, in turn, builds up the current. This circle of increasing power continues to the end of the rack bar stroke. When the rack bar strikes the bottom and breaks the contact, the accumulated current is released into the blasting circuit. This current will therefore be at maximum strength when operation has been at maximum speed.

It is important that the residual magnetism in the magnet cores shall be as great as possible, for this will insure generating the greatest possible current at the beginning of the rack bar stroke, and this, in turn, will mean proportionately greater power at the end of the stroke. The residual magnetism may be low, however, if the machine has been idle for some time. Therefore, it is an excellent practice to build up the magnetism by pushing the rack bar down two or three times before connecting the machine to the blasting circuit.

Sometimes when insufficient current is delivered to the blasting circuit the trouble may not be with the blasting

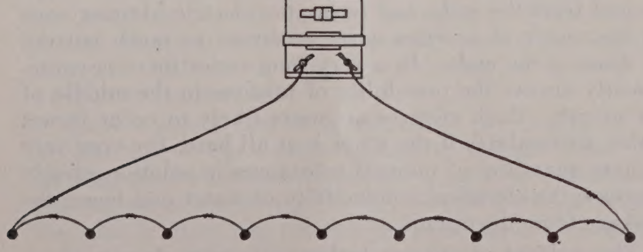


Figure 1. A series connection with a single line of holes

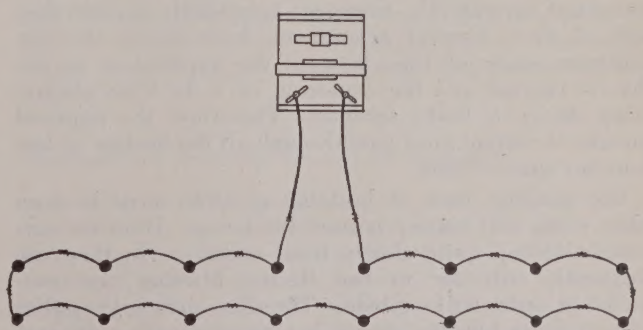


Figure 2. A series connection with a double line of holes

machine or the manner of operating it, but with the leading wires. They may have too high a resistance and thus reduce the current delivered to the blasting caps below the proper amount. This high resistance may be due to the use of too small leading wires or to improperly made splices in them. It also may be due to the substitution of iron for copper leading wires without making a sufficient allowance for the increased resistance of iron. A rule accurate enough to follow for electric blasting is as follows: take the Brown and Sharpe gauge number of copper wire, subtract 8 from this and the result will be the Brown and Sharpe gauge number for iron wire having approximately the same resistance. Again, insufficient current may be due to the fact that a place in the leading wire with damaged insulation or an untaped splice is touching a wet or damp spot and thus allowing some of the current to leak out of the circuit. Recent investigations have disclosed a widespread use of duplex leading wire. This applies to wet work in particular. If duplex wires get wet there is more or less leakage between the wires with a resulting loss to the blasting circuit proper. If the wires are broken and spliced this leakage is greatly increased.

When a power circuit is used, if the voltage is not sufficient for straight series connections or the amperage not enough for regular parallel connections, the blasting circuit should be divided into either parallel series or series parallel groups to make sure that each cap will receive the proper amount of current. Where a power current is available it is recommended that the parallel connection be used wherever possible, as experience has shown that there are fewer misfires with this type of connection.

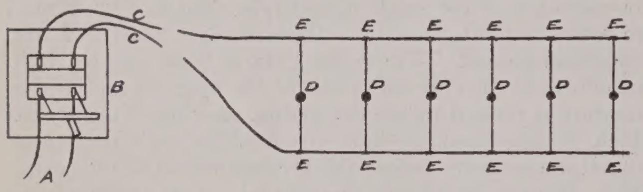


Figure 3. A parallel connection

Building-Up Effects

All electric blasting caps are carefully tested between very close resistance limits before they leave the factory but one can readily see that it is impossible for all bridge wires to have exactly the same resistance. Even with bridges of the same resistance some caps will be slightly more sensitive than others. If an electric current which builds up after it enters the circuit is used for firing, the more sensitive caps may explode first and destroy the circuit before the less sensitive ones receive enough current to fire them. However, it is possible to make electric firing devices within such close sensitive limits that if the proper amount of current (1½ amperes) is suddenly applied they will all fire. Careful experiments have shown that the minimum space of time between the application of the electric current and the explosion of a du Pont electric firing device is 0.014 seconds. Therefore, the required amount of current must pass through all the bridges in less than this space of time.

The simplest case of building-up effect may be seen when a dry cell battery is used for firing. Here the current builds up quite slowly from nothing. In this case frequently only one or two electric blasting caps connected in series will explode. The same principle applies when a series blasting circuit is connected with a dynamo which has no load and consequently is generating practically no current (amperes) at the instant of connection. The current builds up much faster than with a dry cell but still not fast enough and some of the more sensitive caps may explode first and destroy the blasting circuit before the remainder can be fired.

This same principle may be the cause of trouble when a 25-cycle alternating current is used with electric blasting caps connected in series. In this case the half cycle is 0.02 seconds, which is a longer space of time than the critical time of 0.014 seconds. Therefore, it is possible for the current to be applied in such a manner that the crest of an alternation will not pass through the bridge wires in the 0.014 of a second. This gives an opportunity for the more sensitive caps to explode and destroy the circuit. The minimum number of cycles that can be used for electric blasting with series connections figures out at about 36. The 50 and 60-cycle currents can be used for electric blasting in the same manner as direct current. With proper precautions the 25-cycle current can be used with parallel connections because, in this case, the explosion of a single cap does not usually destroy the blasting circuit.

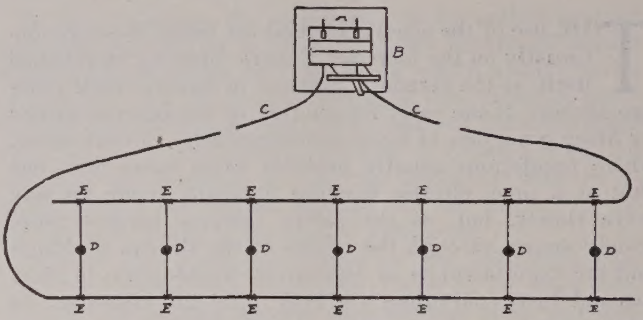


Figure 4. Another method of making a parallel connection

It is to avoid misfires due to the building-up of current in a series blasting circuit that electric blasting machines are designed so that the current is short circuited through the magnet windings while the rack bar is being pushed down and is not sent into the blasting circuit until it has been built up to the proper strength.

Uneven Distribution of Current

Even though there may be sufficient current available for firing a given blast and it may be generated in such a manner that it enters the blasting circuit at full strength without any building-up effect, it is possible that the current may be unevenly distributed in the blasting circuit and misfires arise from this cause. Trouble from uneven distribution of current is most often encountered in straight series connections. The main cause of uneven distribution in this kind of connection is current leakage from the blasting circuit. There is no such thing as absolutely perfect insulation. There is a slight leakage of current from the caps at the ends of a series, more leakage from caps second from the ends, and so on, the electric blasting caps in the center of a series never receiving as much current as those at the ends. In a very long series there is consequently always the possibility of misfires in the middle of the circuit. Such misfires are more likely to occur in wet holes, particularly if the water is at all hard, for even very minute quantities of mineral substances in solution greatly increase the electrical conductivity of water and hence the leakage from the circuit.

This subject of current leakage in series circuits is excellently treated in "Reports of Investigation, Serial No.

2384, August, 1922, Failure of Center Shots in Blasting," obtainable from the Bureau of Mines.

As a result of experience with misfires due to current leakage from a series circuit, it is recommended that, regardless of the source and amount of current available, even in dry work under the most favorable conditions, no more than 50 ordinary electric blasting caps be connected in one series. In wet or damp work this number should be reduced to 30, and if the water is hard, a still lower limit should be set.

If it is necessary to fire longer series than these, as it sometimes is, waterproof electric blasting caps should be used, even in the dry work. Waterproof electric blasting caps not only have a longer capsule which allows space for a longer waterproofing plug between the charge and the sulphur seal, but they also have specially insulated wires. Beneath the cotton insulation is a coating of enamel on the wire. This prevents current leakage from the wires. In sea water waterproof electric blasting caps should always be used whatever the number of caps or system of connection.

One precaution to observe in the use of waterproof electric blasting caps is never to cut a leg wire to make a connection or obtain a short piece of connecting wire. It is a difficult matter to sandpaper the enamel off the leg wires properly after scraping off the insulation so as to assure a good electrical connection. Therefore, connections should always be made at the ends of the wires as they come from the manufacturer. If connecting wire is necessary, get the wire made for this purpose.

Current leakage from a blasting circuit may also be caused or aggravated by careless or rough tamping by which the insulation on the wires may be torn or abraded so as to destroy its usefulness. It is therefore necessary to use care in wielding the tamping stick or block after the primers have been placed in the bore holes. In well-drill holes either loam or fine sand free from sharp grit or small pieces of rock should be used for stemming material. In underground work it is best to use clay, loam or fine sand put up in dummy cartridges. These can be packed firmly in place by a careful use of the tamping stick with little or no danger of breaking or injuring the wires or the insulation.

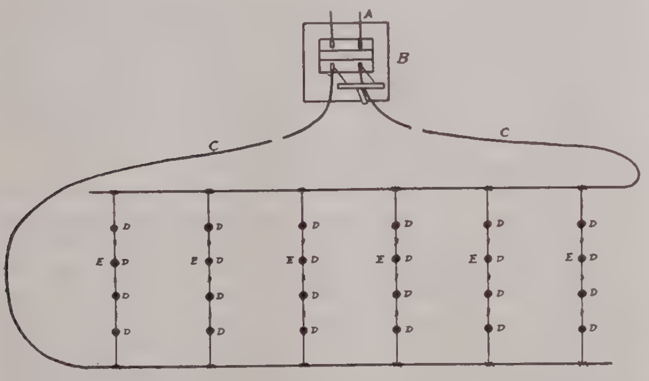


Figure 5. One method of making a parallel series connection

When a power current is available, practically all the troubles due to the current leakage in straight series connections can be avoided by the use of parallel connections. The current can be divided evenly outside the bore holes so that each blasting cap receives the same amount of current at the same instant. There is none of the trouble due to the caps in the middle of the circuit receiving less current than those at the ends. This does not mean, however, that waterproof electric blasting caps should not be used in sea water and other hard water. If the amperage is not sufficient for straight parallel connections the circuit should be divided into groups by using the parallel series or series parallel. In order to assure an even distribution of current when parallel series or series parallel connections are used, the same number of electric blasting caps should be connected in each group. When the division does not come out even, some blasters take the precaution of adding extra electric blasting caps so that each shunt or group will receive the same amount of current. Bringing one leading wire from each end of the blast also aids in securing an even division of the current in a parallel circuit.

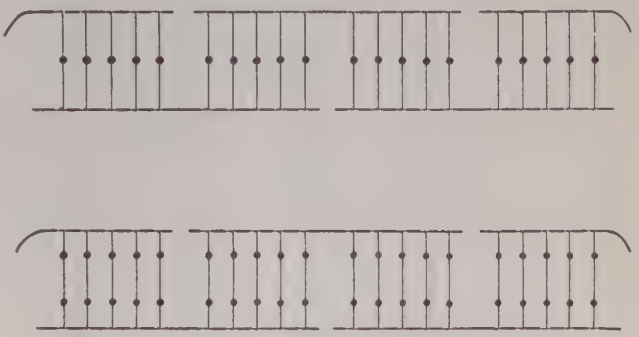


Figure 6. Two series parallel connections

In underground work for drifting, raising and sinking there are two very satisfactory methods of parallel connections in use. One method is to take one wire from each blasting cap and twist the bare ends into a compact bunch; take the second wires from the caps and twist them into another bunch; and then connect one leading wire to one of these bunches and the other leading wire to the other bunch. This method makes it necessary to use electric blasting caps with wires longer than ordinary but the connection can be made very quickly.

In the other method, a wooden plug is driven into each of two side holes about two-thirds of the distance up the face and a piece of bare No. 14 or No. 18 gauge copper wire is strung across the face and fastened to these plugs. Then, in a similar manner, plugs are driven about one-third of the way up the face and a second piece of bare copper wise is strung across the face at this level. These wires are commonly called buss wires or busses. One leg wire from each electric blasting cap is connected to the upper buss wire and the other leg wire is connected to the lower buss wire. One leading wire is connected to one end of the upper buss wire and the other leading wire is connected to the opposite end of the lower buss wire. This connection is advantageous where there are so many electric blasting caps or other electric firing devices that the bunches would be too difficult to handle; also where the face is so large that if the bunching method were used it would require electric firing devices with excessively long leg wires.

Method for Tracing Causes of Misfires

In order to facilitate locating the cause of electric blasting troubles, one company designed the elimination chart shown in this article. Following this will almost always enable a blaster to trace the cause of misfires. In using the chart never forget that missed electric blasting caps which can be connected again and shot by another application of the current indicate purely electrical troubles in the circuit.

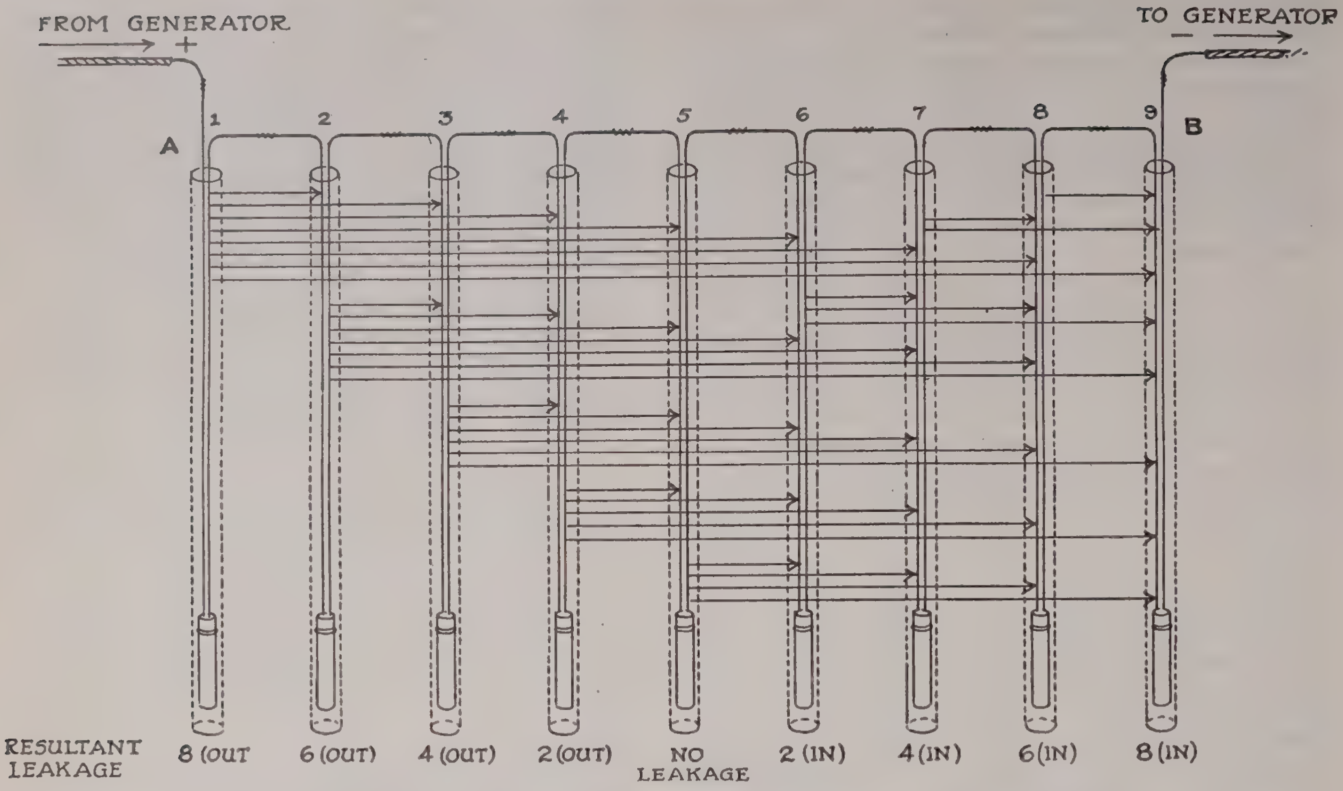


DIAGRAM SHOWING THEORETICAL LEAKAGE PATHS FROM A SERIES CONNECTION
(FROM BUREAU OF MINES "REPORTS OF INVESTIGATIONS, SERIAL 2384, FAILURE OF CENTER SHOTS IN BLASTING")

"Then eight lines or paths will leave or enter each hole. The direction of all lines is indicated by the arrow-heads. The lines at hole No. 1 are all shown coming from the hole, as obviously there is no current leakage into this hole. Beginning with hole No. 2 there is a tendency for the current to return to the circuit. This tendency increases with each successive hole, whereas there is a decreasing tendency for the current to leak from the circuit. The resultant of these leakage lines at each hole from or into the circuit has been indicated beneath each hole."

New Method of Burning Lime Prevents Waste

An outstanding problem in the lime industry is the profitable utilization of the small stone, known as spalls and fines. Stone under four inches in size cannot be calcined successfully in the shaft kiln, and every day thousands of tons of such stone are either entirely wasted or are sold at prices so low as scarcely to cover the cost of production. Lime is an essential commodity in the chemical, agricultural and building industries. Lime is produced at over 400 plants distributed throughout almost every state in the Union, and the annual production value is approximately $40,000,000. Any improvement in quarrying or operation processes which will eliminate waste is, therefore, of real economic importance.

The Bureau of Mines of the Department of Commerce, through the Nonmetallic Minerals Station at New Brunswick, N. J., has given much study to possible solutions for this waste problem. It has been found that fines are successfully calcined in the rotary kiln, and that rotary kilns are gradually being brought to a higher point of efficiency, but that rotary kilns present certain serious disadvantages. Having in view the development of equipment less costly, less cumbersome, easier to manipulate and of higher fuel efficiency than the rotary kiln, exhaustive experiments have been made with a sintering machine such as is used for roasting sulphide ores.

The sintering machine consists essentially of a series of travelling pallets with perforated floors. The pallets loaded with crushed limestone pass beneath a burner which supplies an intense heat, and over a suction box which maintains a downward draft to carry the flame through the charge. Complete calcination is attained in 30 to 60 minutes. Small scale tests were followed by more complete tests on a small-size standard commercial machine. A general average of all tests made gave a fuel ratio of 5.5 pounds of lime per pound of kerosene plus 5 per cent of coal which was mixed with the charge. This compares favorably with present commercial practice. Several important changes may be found necessary before the highest point of efficiency is attained.

The advantages claimed for the sintering machine are low first cost, low maintenance cost, fair fuel ratio, continuous operation, and ability to use small stone. The results of the investigation indicate that the machine has excellent possibilities for the production of lime from small stone, but considerable redesigning is necessary to adapt it to this use. A detailed description of the machine, the changes made in its construction, and the experiments conducted with it are given in Serial 2762, entitled "Manufacture of lime from small stone with a sintering machine," a copy of which may be obtained on request from the Bureau of Mines, Department of Commerce, Washington, D. C.

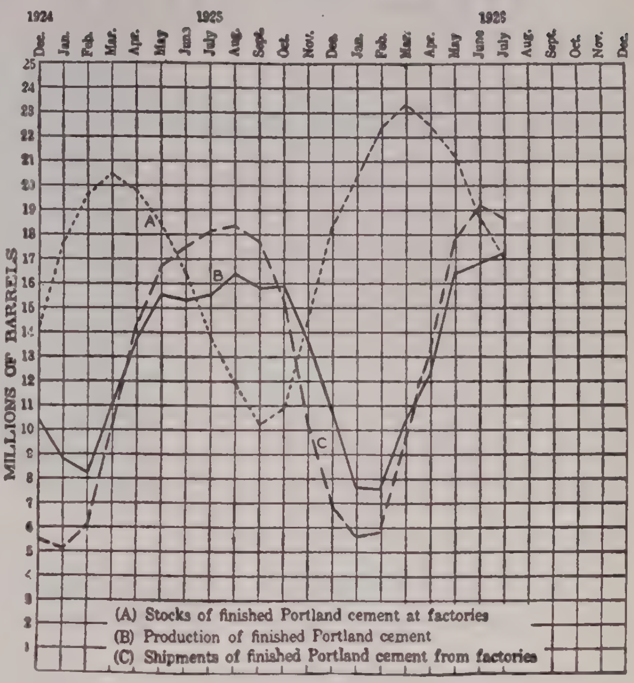
Power Show to Reflect Tremendous Advances

The fifth annual national exposition of Power and Mechanical Engineering will be held from December 6 to 11, 1926, in the Grand Central Palace in New York City. The showings of all types of power and heat generating, distributing and using equipment will fill four floors. Over 450 exhibits are contemplated.

Every mechanical engineer will find something of importance and novelty in the refrigerating, heating and ventilating machinery, machine tools and power transmission devices, as well as in the usual important exhibits of power plant apparatus.

Cement Statistics for July

PRODUCTION of portland cement reached a new level in July, while shipments were exceeded only by those of the preceding month and were over 3 per cent greater than the shipments in July, 1925. Portland cement stocks decreased but were still high and at the end of July were more than 23 per cent greater than on July 31, 1925. These statistics, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are compiled from reports for July, 1926, received direct from all manufacturing plants except three, for which estimates were necessary on account of lack of returns.



Estimated Clinker (Unground Cement) at the Mills at End of Each Month, 1925 and 1926, in Barrels

Month—	1925	1926
January	7.017.000	9.074.000
February	8.497.000	10,931,000
March	9,962,000	12.284,000
April	9,731.000	12.934,000
May	9,053,000	11,649,000
June	7.937.000	†10.085.000
July	6,961,000	8,490,000
August	5.640.000	
September	4,561,000	
October	4,086,000	
November	5,013.000	
December	6,469,000	

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†Revised.

Production, Shipments and Stocks of Finished Portland Cement, by Months and by Districts

	Production		Shipments		Stocks at end of month	
Month—	1925	1926	1925	1926	1925	1926
January	8,856,000	7,887,000	5,162,000	5,672,000	17,656,000	20,582,000
February	8,255,000	7,731,000	6,015,000	5,820,000	19,689,000	22,384,000
March	11,034,000	10,355,000	10,279,000	9,539,000	20,469,000	23,200,000
First quarter	28,145,000	25,973,000	21,456,000	21,031,000		
April	13,807,000	12,401,000	14,394,000	12,961,000	19,877,000	22,640,000
May	15,503,000	16,472,000	16,735,000	17,951,000	18,440,000	21,173,000
June	15,387,000	16,827,000	17,501,000	†19,113,000	16,409,000	†18,900,000
Second quarter	44,697,000	45,700,000	48,630,000	50,025,000		
July	15,641,000	17,121,000	18,131,000	18,767,000	13,896,000	17,254,000
August	16,419,000		18,383.000		11,952,000	
September	15,939,000		17,711,000		10,247,000	
Third quarter	47,999.000		54,225.000			
October	15,992,000		15,309,000		10,979,000	
November	13,656,000		10,187,000		14,534,000	
December	10,713,000		6,917,000		18,365,000	
Fourth quarter	40,361.000		32,413.000			
	161,202,000		156,724,000			

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†Revised.

	Production—July		Shipments—July		Stocks at end of July		Stocks at end of July,
Commercial District—	1925	1926	1925	1926	1925	1926	1926†
East. Pa., N. J. & Md	3,703,000	3,935,000	4,564,000	4,215,000	2,460,000	3,687,000	3,967,000
New York	838.000	911,000	1,045,000	1,146,000	757,000	992,000	1,227,000
Ohio, West. Pa., & W. Va	1,618,000	1,797,000	1,754,000	2,006,000	1,612,000	2,017,000	2,226,000
Michigan	1,223,000	1,506.000	1,322,000	1,681,000	967,000	1,558,000	1,734,000
Wis., Ill., Ind. & Ky	2.249.000	2.453.000	2.743.000	3.018.000	2.611.000	2,400.000	2.964,000
Va., Tenn., Ala. & Ga	1,230,000	1,445.000	1,375.000	1,420.000	264.000	1,150,000	1,125,000
East. Mo., Ia., Minn. & S. Dak	1,444,000	1,602,000	1.846.000	1.756.000	2.399.000	2.263.000	2.417.000
West. Mo., Neb., Kans., & Okla	1,110,000	1,067,000	1,187,000	1,160,000	1,529,000	1,361,000	1,454,000
Texas	454,000	459,000	463,000	464,000	232,000	472.000	478,000
Calif.	1,122,000	1,302,000	1.139,000	1,276,000	435,000	528,000	502,000
Colo. & Utah	246,000	644,000	208,000	625,000	332,000	826,000	806,000
Ore., Wash. & Mont	404,000		485,000		248,000		
	15,641,000	17,121,000	18,131,000	17,767,000	13.896,000	17,254,000	18,900,000

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†Revised.

MEN and MILLS

Notes from the Field

Beaver Portland Interests Buy Gravel Plant

Another step toward the amalgamation of the sand and gravel and building material industry in Oregon was taken recently when the Ross Island Sand and Gravel Company purchased the Oregon Gravel Company of Salem, Ore. The purchase of the Beaver Portland Cement Company by the Ross Island Sand and Gravel Company was announced in these columns last month.

According to D. L. Carpenter, former president of the Beaver Portland Cement Company and now president of the Ross Island Co., the Salem concern, like the cement company, will maintain its corporate identity and will be operated as a distinct organization. While the details of operation of the three concerns will be handled separately, the sales and distribution activities will be merged for the purpose of securing lower costs and greater efficiency in serving the community.

Progress Shown at Great Lakes Cement Plant

Construction at the new plant of the Great Lakes Portland Cement Company, Buffalo, is progressing rapidly toward completion. Additional storage for the product of two more kilns is to be built. According to recent information the structures containing the raw mill and the finish mill are about completed, the slurry tanks are completed and piles are being driven for the 32 storage silos. The reinforced concrete structures of this new plant are being erected by the Burrell Engineering and Construction Company, Chicago.

New Work at York Plant of Sandusky Cement Company

The Burrell Engineering and Construction Company will erect two new silos, for the storage of waterproof cement, at the York, Pa., plant of the Sandusky Cement Company. These silos will be 20 feet by 69 feet, and will be of reinforced concrete construction. A reinforced concrete pump house will be erected at the same time.

J. W. Kennedy Becomes Engineer of Service Bureau for Huron and Wyandotte Companies

J. W. Kennedy, formerly with the Portland Cement Association in the general offices in Chicago, has been appointed engineer of the newly organized service bureau of the Huron and Wyandotte Portland Cement companies, with headquarters in Detroit. A more complete story on this appointment will be found in the regular section of this magazine.

New Dryers for N. W. States Plant

The Mason City, Iowa, plant of the Northwestern States Portland Cement Company is installing two new dryers. They are 80 inches in diameter and 45 feet long. The McGann Manufacturing Company of York, Pa., manufactured the equipment and it is being installed by plant labor. With these dryers, the company is also installing two Cyclone dust collectors. The new equipment will be in operation by the end of September.

Dixie Stock Turned Over to Merger Committee

$40,000,000 Merger Now Complete

Richard Hardy, president of the Dixie Portland Cement Company of Chattanooga, Tenn., announced that 75 per cent of the stock of the company had been turned over to the committee in charge of the merger of the Dixie company with the Dexter Portland Cement Company, the Pennsylvania Portland Cement Company and the Clinchfield Portland Cement Corporation.

Five million dollars of the Dixie stock was held in Chattanooga, $1,000,000 in Nashville, $1,000,000 in Michigan and the rest scattered about throughout the country. The action of the Dixie Portland Cement Company in turning over this stock completed the merger, which involved plants with a total capital of about $40,000,000.

Sectional Committee on Cement

The personnel of the Sectional Committee on Cement, organized under American Engineering Standards Committee procedure, has now been completed. The membership is as follows:

American Association State Highway Officials—F. H. Jackson, H. S. Mattimore, E. C. Welden.

American Concrete Institute—J. G. Ahlers, E. D. Boyer, W. K. Hatt.

American Institute of Architects—Thomas Nolan.

American Railway Engineering Association—Meyer Hirschthal, J. F. Leonard, J. J. Yates.

American Society Civil Engineers—Richard L. Humphrey, Thaddeus Merriman, A. E. Phillips.

American Society Municipal Improvements—H. E. Breed, E. E. Butterfield.

American Society Testing Materials—R. S. Greenman, W. H. Klein, L. W. Walter.

Associated General Contractors of America—W. R. Hughes.

Portland Cement Association—Ernest Ashton, F. W. Kelley, W. M. Kinney.

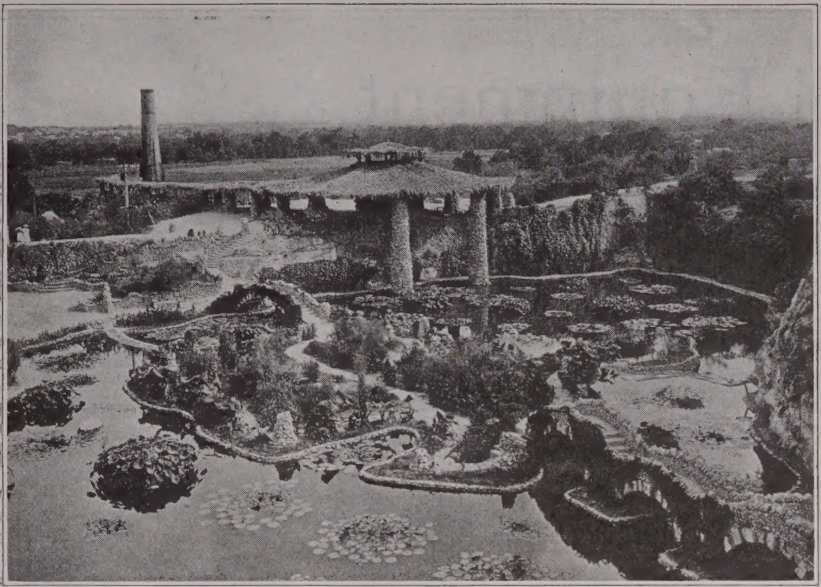
U. S. Government (Federal Specification Board) (Liaison Representatives)—P. H. Bates, J. W. Ginder, J. M. Young.

Producers	5
Consumers	12
General Interests	5
	22
Liaison Representatives	3

The society as sponsor will submit the revised Standard Specifications and Tests for Portland Cement to this sectional committee for its consideration, subject to adoption of the specifications by letter ballot of the society. Under A. E. S. C. procedure, approval by the sectional committee and subsequent adoption by the sponsor of any modifications that may be proposed is required in order that the specifications may be submitted to the A. E. S. C. for approval as American standard.

San Antonio Company Covers Kilns

The San Antonio Portland Cement Company is erecting a building to cover its kilns at Cementville, Texas. The building will be 75 by 100 feet in plan and will cost about $20,000.



The original quarry of the Alamo Cement Company, from which in 1879, the first material was taken and manufactured into portland cement, is now a part of beautiful Breckenridge Park in San Antonio, Texas. In the background is the chimney of the old Schoefer kiln. The quarry pit has been taken over by the San Antonio Park Commissioner and converted into a sunken garden and Japanese lily pond. The old quarry has become one of the show places of the city

Cement Company Buys Lighting Plant

Medford, Ore.—At a special election held in Gold Hill, Ore., the proposition of the Beaver Portland Cement Company to buy the Gold Hill lighting plant was accepted by a vote of 155 to 93. The Beaver Portland Cement Company's mill is located in Gold Hill and the purchase of the lighting plant followed the receiving of competitive bids for its sale.

U. S. Buys Much Cement

WASHINGTON, D. C.—Purchases of cement by the Federal government average 800,000 barrels a year, all of which must be officially approved by the Bureau of Standards after being subjected to quality tests. At present there is an unusually large number of requests from governmental agencies for testing of cements, indicating a marked increase in the amount of building the government is undertaking in various parts of the country. For the purpose of testing cement the bureau maintains three special laboratories in addition to its main laboratory at Washington. These are located at Northampton, Pa.; Denver and San Francisco.

Cement Engineer from Spain Visits Denver

Charles J. Tomlinson, cement mill engineer for a Spanish subsidiary of the Foundation Company in Barcelona, Spain, visited with relatives in Denver, Colo., on his way to Sao Paulo, Brazil, where he will erect a 3,000-barrel plant. When the Brazil work is completed he will return to Barcelona.

Australian Cement Production

The annual capacity of the cement producing companies of the commonwealth of Australia is at present 831,000 tons, and plant for a further 160,000 tons per annum is in course of erection. During the first eleven months of 1925 Australia imported 20,045 tons of cement from overseas countries, and the total sales in the commonwealth were 555,240 tons.

Consider American-Made Products

International Cement Corporation Distributes Pamphlet

"Patronize American products" is the theme of a pamphlet distributed by the International Cement Corporation to help overcome the use of foreign cement in the South Atlantic states. The pamphlet is a reprint of an editorial in the Miami *Daily News and Metropolis.*

It is an appeal to patriotism in business as well as in politics and concludes: "It is estimated that approximately a quarter of a million barrels of cement is required annually in the present road and city building projects of southern Florida. Building material firms here are ready to supply this material direct from the American manufacturers. But if contractors yield to the impulse to save a few hundred dollars and buy this product beyond the seas, not only the American cement factories will feel the effect, but local material firms will naturally lose in curtailed activities, so that Miami business will be the loser."

Sandusky Cement Company Builds Concrete Stack

A reinforced concrete stack, 200 feet high, has just been completed at the West York (Pa.) mill of the Sandusky Cement Company. The stack is 16 feet in diameter inside measurement at the base and 10 feet in diameter at the top. The foundations extend down to bedrock 28 feet below ground level. The Rust Engineering Company of Pittsburgh, Pa., were the contractors.

The stack is connected to three kilns by means of a large concrete flue equipped with a dust recovering installation, so designed as to remove all possibility of dust from the kilns settling on the surrounding country.

Superior Company Adds Drilling Equipment

A complete Armstrong System drilling outfit has been purchased by the Superior Portland Cement Company of Seattle, Wash., and added to the present quarry equipment of that company.

New Storage Bins for Duluth Plant of Universal Co.

Construction of nine new storage bins at the Duluth plant of the Universal Portland Cement Company is under way. The new bins are to be of concrete and will increase the storage capacity at the plant to approximately 550,000 barrels.

Construction of the new bins was found necessary because of the need for additional storage facilities during seasonal fluctuations in shipments. The new bins, each of which will hold about 10,000 barrels of cement, will duplicate the nine bins constructed two years ago.

The Bland Engineering Company of Minneapolis will construct the bins.

Freight Rate Revised

WASHINGTON, D. C.—The Interstate Commerce Commission issued on June 24 an order sustaining complaint of the Sandusky Cement Company and awarding reparation on a carload of cement from York, Pa., to Cape Girardeau, Mo., to the extent that the rate charged, 52.5 cents per 100 pounds, exceeded that found applicable, which was 42 cents, made up of a proportional rate of 30.5 cents from York to St. Louis, plus the local rate from St. Louis to Cape Girardeau.

"A combination of two local rates to and from an intermediate point, subject to the so-called combination rule, would have produced a lower charge than a combination of a local and a proportional rate to and from the same intermediate point, not subject to the rule," but the commission held that the combination of the local and proportional rate was applicable and the shipper entitled to reparation to that extent.

Mill Equipment

Manufacturer Suggests Air-Filter for Accurate Classification

Continuous suction air-filters for dust-recovery are gaining favor steadily in the cement field, according to Mr. M. A. Eiben, president of Northern Blower Company, Cleveland, manufacturers of "Norblo" dust-handling and material-recovery equipment.

"The dust-recovery systems, for example, which we have installed for the Southern Cement Company, of Birmingham, Alabama, and for the Nazareth Portland Cement Co., Nazareth, Pa., are both of the 'Norblo' continuous suction air-filter type," said Mr. Eiben.

"One reason," he continued, "for the growing use of the air-filter type is its ability to operate on an absolutely continuous schedule—it being even possible to shut down one of the cylindrical separating units for repairs without in the least interfering with the operation or efficiency of the others.

"Where accurate classifying of the recovered material by mesh-grading is needed, the air-filter is practically always preferable on account of its method of operation. Each filter consists of three or more cylindrical steel cases containing the bags or stockings through which the air is drawn. By means of automatic valves, the air current is reversed in each of these bags every few seconds, thus shaking off the dust and thoroughly cleaning each set of bags in periodic succession. The result of this is to keep all bags at a constant high recovery percentage efficiency; and this accounts, in a large measure, for the growing use of this type in the cement industry."

Foos Diesel Engines

Having a speed range approximately double that of other designs and the weight reduced to 50 pounds as against 100 to 300 pounds per horsepower in other types, makes the Foos Diesel engine, Type L, noteworthy.

It is completely enclosed. Direct drive to certain types of machinery is possible because of its high speed range. This engine is well suited for installation in mobile or semi-mobile industrial machinery requiring self-contained independent power units. In stationary applications it meets the requirements of a peak load or standby power generator, and similar installations. This equipment is manufactured by the Foos Gas Engine Company, Springfield, Ohio.

Improved Hydrator

Numerous difficulties experienced in the hydration of lime have been overcome by the Schulthess hydrator, which eliminates previous breaking up. The crude lime is fed into the hopper just as it comes from the kiln, without further preparation. The hydrator produces a very fine powder that is perfectly dry.

An effort has been made in the design of the machine to reduce the motive power to less than half of that ordinarily required.

The McGann Manufacturing Co., Inc., York, Pennsylvania, produces the Schulthess automatic continuous lime hydrator.

With the Manufacturers

Ivan Sewart Forde, who for the past three years has been manager of the Sales Promotion Department of the *Diamond Power Specialty Corporation,* has resigned to become affiliated with the *Furnace Engineering Company,* manufacturer of the *Simplex Unit Pulverizer,* as Sales Manager, with headquarters at 5 Beekman Street, New York.

Mr. Forde was for a number of years previous manager of the Small Turbine Division of the *Westinghouse Electric and Manufacturing Company.*

Fifty sales representatives of the *Link-Belt Company,* Chicago, gathered at the Dodge Works, Indianapolis, Indiana, for their Drive Chain conference July 7, 8 and 9, under the chairmanship of James S. Watson, General Manager of the Dodge plant.

A round-table discussion was followed by the dissection and criticism of the advance edition of the *1926 Link-Belt Silent Chain Data Book,* the conference closing with an intensive study of the products, and the methods of production at the Dodge plant.

Ernest Wooler, Chief Engineer of the *Timken Roller Bearing Company* of Canton, Ohio, sailed July 14th for England, to investigate the development of anti-friction bearing in all industries. The British *Timken* plant at Common Lane, Ward End, Birmingham, will also be visited.

An Englishman by birth, Mr. Wooler first came to the United States in 1913 to study American practices and methods of motor car construction and manufacture, remaining here as engineer of *Continental Motors Company,* Detroit. He later left this company to become assistant chief engineer of the Chandler Motor Car Company, and in 1919 became chief engineer of the Cleveland Automobile Company. A year after accepting the position of automotive engineer of the Timken Company in 1925, he was advanced to chief engineer in charge of all automotive, industrial, experimental and service engineering.

The Coates Steel Products Company is the new corporate name of the *St. Louis Steel Products Company,* according to an announcement. The personnel is unchanged and business will be transacted as heretofore at the general office and works at Greenville, Ohio.

Mr. A. E. Coates, formerly assistant manager of the *York Engineering and Manufacturing Company,* New Orleans, La., has been elected Vice-president of the *Coates Steel Products Co.,* Greenville, Ohio.

Mr. Coates will represent the firm in the eastern states, making his headquarters at Upper Darby, Pennsylvania. He is a member of the American Society of Mechanical Engineers.

Mr. L. F. Kuhman has been appointed Vice-president and Director of the *Andrews-Bradshaw Company,* Pittsburgh, Pa., Sales Managers for the *Tracyfier.* He has been associated with the company for the past three and a half years. For eight years prior to that time he was engaged as Sales Engineer for the *Ingersoll-Rand Company* in the Pittsburgh district.

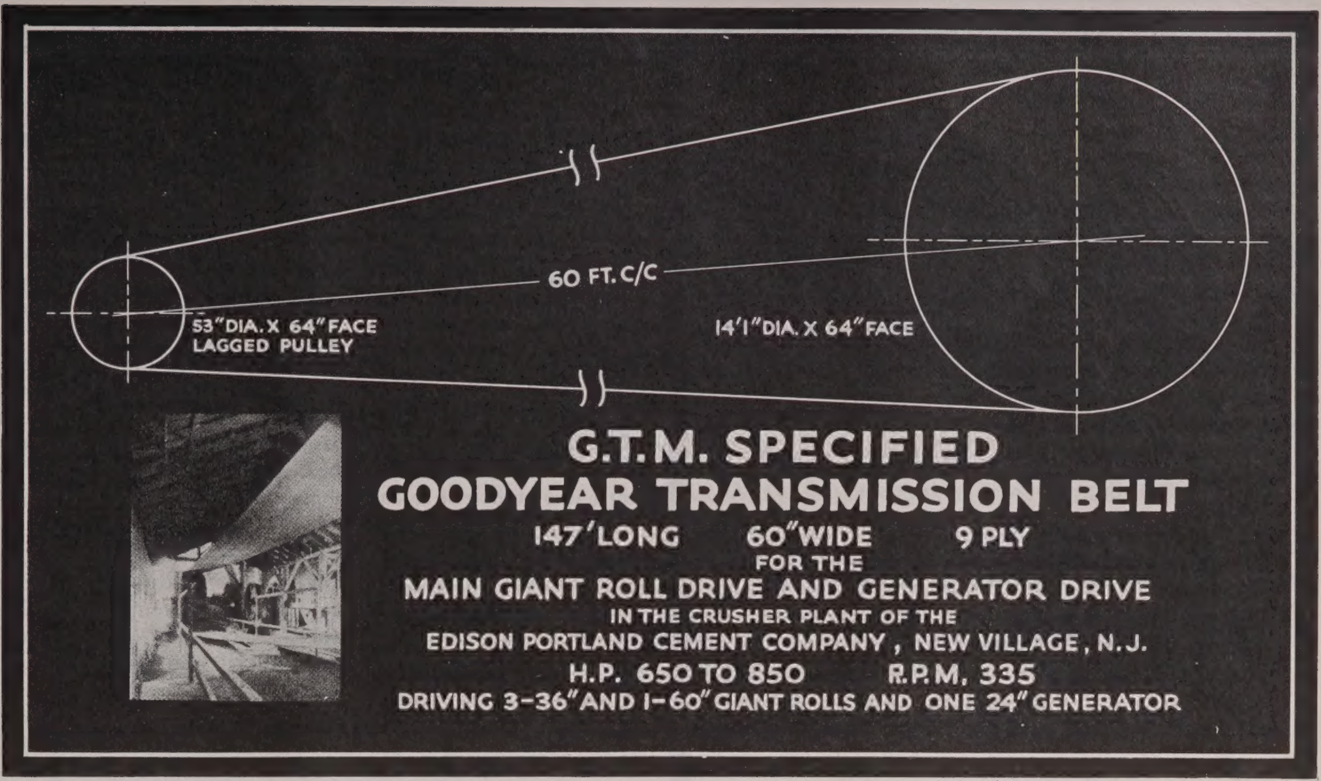
Mr. H. G. Davis, formerly associated with the Pfaudler Company, Milwaukee, Wisconsin, has recently joined the sales organization of *Foote Bros. Gear and Machine Company.* He will cover the north side of Chicago and its suburbs.

The *Indianapolis Belting & Supply Co.,* Indianapolis, Indiana, have recently been appointed as district representatives for the IXL Speed Reducers and Gear Products, manufactured by the *Foote Bros. Gear & Machine Company.*

They will cover the city of Indianapolis and surrounding territory for a radius of 75 miles.

The *Roberts Tool & Supply Company* of Syracuse, New York, have recently been appointed district representatives for the line of IXL speed reducers and gear products, manufactured by the *Foote Bros. Gear & Machine Company,* Chicago.

They will operate in Syracuse and vicinity.


60 FT. C/C
53" DIA. X 64" FACE
LAGGED PULLEY
14'1" DIA. X 64" FACE
G.T.M. SPECIFIED
GOODYEAR TRANSMISSION BELT
147' LONG 60" WIDE 9 PLY
FOR THE
MAIN GIANT ROLL DRIVE AND GENERATOR DRIVE
IN THE CRUSHER PLANT OF THE
EDISON PORTLAND CEMENT COMPANY, NEW VILLAGE, N. J.
H.P. 650 TO 850 R.P.M. 335
DRIVING 3-36" AND 1-60" GIANT ROLLS AND ONE 24" GENERATOR

Blueprint sketch of the Goodyear-equipped main roll drive in the plant of the Edison Portland Cement Company, New Village, N. J.; with inset photograph of the installation

Copyright 1926, by The Goodyear Tire & Rubber Co., Inc.

The Giant Roll Drive—and the G. T. M.

You take a limestone boulder, weighing anywhere from three to ten tons, and it is a pretty tough nut to crack. The crushers that bite into it require a lot of power, and the belt that drives the rolls has to be big and husky and equal to the shock.

These are the primary facts about cement manufacture that led the Edison Portland Cement Company, of New Village, N. J., to design their new crusher installation five years ago as a complete unit—rolls, shafting, pulleys and motor all carefully calculated to work together—and then for advice on what belt should be used, they called in the G. T. M.—Goodyear Technical Man.

The G. T. M. and the Plant Belt Engineer worked together on an expert and practical survey of all the main crusher drive requirements. They made careful measurements of the driving and driven pulleys; the center-to-center distance; the starting, normal and peak loads that would have to be carried; the speed per minute that would need to be maintained. They also figured in an ample margin of belt strength to provide for the terrific shock of that contact between the rolls and a ten-ton lump of solid rock.

The belt the G. T. M. recommended for that drive was installed on April 22, 1922, and now, after more than four years of day-in and day-out handling of 650 to 850 horsepower loads in that wracking duty, it looks good for an indefinite time to come. "It shows no sign whatever of being worn," writes the Assistant Purchasing Agent for the Company. "Considering the hard shocks this belt has been subjected to, the performance to date is really remarkable."

This is a Goodyear Belt, one of the largest transmission belts Goodyear has manufactured. It is 147 feet long, 60 inches wide, 9 ply. It is 60 feet center-to-center, drives at an angle of 12 degrees, and uses no idler. In its long service it naturally has required cutting for stretch, but, as the Plant Belt Engineer says, "it has never given a minute's trouble — it does nothing but work."

Here the Goodyear Analysis Plan clearly demonstrates its value. Confronted by an entirely new installation, the G. T. M. had to make his recommendations from mechanical factors, his own expert knowledge of belting, and his practical experience in this industry. The result of his analysis was that *the right belt* was specified and built for that particular job.

It stands to reason that belts so specified and built will give more efficient, economical and trouble-free service than just any belt you happen to apply. The proof of that reasoning is in the performance of Goodyear Belts, like this one on the main drive of the Edison Portland Cement Company, and like thousands of others in transmission, conveyor and elevator duty all over the country.

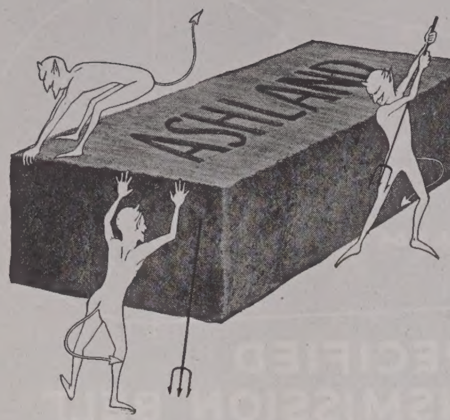
If you have a new installation, or a belt problem on an old one, you may find it very profitable to call in the G. T. M. He will base his findings solely on a careful study of your needs, and you may depend on any Goodyear Mechanical Rubber Goods that he recommends—Belts, Hose, Valves and Packing—to give you the maximum of good service and long wear at low cost. For further information about the Goodyear Plant Analysis Method, G. T. M. service, or Goodyear Mechanical Rubber Goods in your line of industry, write to Goodyear, Akron, Ohio, or Los Angeles, Calif.

Goodyear Means Good Wear

VALVES · PACKING BELTS · HOSE

GOODYEAR

Index to Advertisers on Page 89 of This Section



There's Many An Extra Heat in Every Ashland Lining

Because of the very nature of its composition, Ashland fire brick lasts longer, goes farther and gives less trouble than ordinary fire brick. The Kentucky clays from which it is made contain less than 5% of fluxing elements.

Its uniform dimensions leave little chance for heat and slag to seep in and attack the brick work. Its true corners and edges require less time and mortar for laying up.

These advantages are reflected in steady, uninterrupted operation, more heats per lining, smaller repair expense and lower service cost. Try Ashland next time — the fire brick that lasts.

ASHLAND FIRE BRICK CO.
Incorporated 1886
ASHLAND, KENTUCKY
Manufacturers Of Sized Brick

Sales and Service Offices
New York City, Cleveland, O., Indianapolis, Ind., Chicago, Ill., Detroit, Mich., Havana, Cuba.

New Treatment to Prevent Setting of Slurry

A patent has recently been granted to R. C. Newhouse, formerly chief engineer of the Crushing and Cement Machinery Department of the Allis-Chalmers Manufacturing Company, providing for a treatment to prevent setting of slurry made from blast furnace slag.

Finely ground blast furnace slag is known to possess the characteristics of absorbing water and eventually setting, a characteristic that causes considerable difficulty in wet process portland cement plants using slag as one of the major raw materials. After a long series of experiments conducted by the Allis-Chalmers Manufacturing Company under the direction of Mr. Newhouse, it was found that this tendency was more pronounced when the material was heated and that the heat produced in the grinding mill was sufficient to cause hardening soon after the slurry was stored.

In order to retard the setting, it had been proposed previously that dextrin be added to the mixture and, while this retards the setting action to some extent, its use has not been altogether satisfactory. As a result of the experiments conducted by Mr. Newhouse, it was discovered that the tendency of materials such as ground slag to absorb water and to solidify may be retarded and substantially eliminated if the temperature of the mixture of slag and water is reduced to substantially normal or atmospheric temperature as soon as the mixture leaves the source of heat. If the material is cooled immediately after it leaves the comminuting mill and before it is delivered to storage tanks, subsequent hardening or setting within a reasonable time is prevented and the material may be withdrawn without difficulty.

The patent provides for this treatment of cooling the slurry either by circulating it through a cooling chamber or inducing a cooling medium, such as water, directly into the mixture.

For the first method a cooling chamber similar in principle to automatic refrigeration brings the slurry in contact with chilled pipes. The second method is a modification to effect commercial exploitation of the process. In this method the excess water must be removed prior to subsequent treatment of the material in a kiln.

Mr. Newhouse, the patentee of this process, is at present vice president and manager of the engineering department of the Cowham Engineering Company. For many years he has been identified with cement plant operation, design and construction. In his position as chief engineer of the Allis-Chalmers Manufacturing Company he invented and patented the Fairmont crusher, grid frame division head compeb mill, combination division head compeb mill, the concavex and the Newhouse gyratory crusher. He has also had granted numerous patents concerning jaw crushers, dust collectors, crushing rolls, conveying and transporting machinery, control systems for electric shovels and automatically operated hoists and other devices allied with the crushing, cement and mining industries.

A bulletin has recently been issued by the Magnetic Manufacturing Company, Milwaukee, Wisconsin, covering the construction and use of its high-duty magnetic pulleys and magnetic pulley separators. The principle of the separator permits continuous operation, since the material is actually not separated until it has been borne half-way around the pulley, when the tramp iron falls away into a separated pile.

A handy table of weights of materials, including coal, gypsum, lime and slag, in pounds per cubic foot, is shown.